

Management Plan for the South Holston Tailwater Trout Fishery 2009-2014



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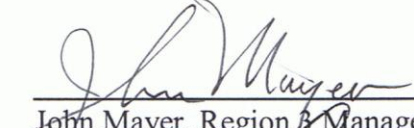
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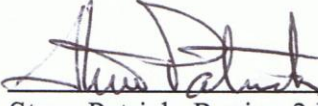
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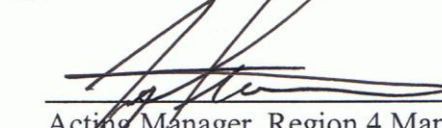

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South Holston Tailwater Trout Fishery Management Plan (2009-2014)

I. Goal

The Tennessee Wildlife Resources Agency's (TWRA's) management goal for the South Holston Tailwater (South Fork Holston River) is to continue to provide a high-quality trout fishery and the variety of angling opportunities it offers.

II. Strategies and Objectives

TWRA's primary strategies for attaining the management goal for the South Holston Tailwater will be to feature its exceptional wild brown trout *Salmo trutta* fishery (which is comparatively unique among Tennessee's tailwaters) while also providing put-and-grow and put-and-take fisheries for rainbow trout *Oncorhynchus mykiss*. Given these basic strategies, the management objectives during 2009-2014 will be to:

- Maintain the abundance of large trout in the fishery. The 16-22 inch protected length range (PLR) regulation will continue, with the objective of maintaining a mean electrofishing catch rate for trout within PLR of at least 25 fish/h during 2009-2014.
- Maintain the wild brown trout fishery. Suspension of brown trout stocking, seasonal closure of two spawning refuges, and the snagging ban will remain in effect, with the objective of maintaining a mean electrofishing catch rate of at least 135 fish/h for brown trout ≥ 7 inches during 2009-2014.
- Maintain rainbow trout stocking rates. The current stocking rates for rainbow trout fingerlings (50,000/year) and adults (50,000/year) will be maintained during 2009-2014, with the objective of producing a mean electrofishing catch rate of at least 50 fish/h for rainbow trout ≥ 7 inches during 2009-2014.

III. Background



The South Holston Tailwater was created in 1950 when the Tennessee Valley Authority (TVA) completed construction of the dam at South Fork Holston River Mile (SFHRM) 49.8 in Sullivan County, Tennessee. The reservoir upstream of the dam (7,580 acres)

has a drainage area of 703 mi.² and extends 24 miles upstream into Washington County, Virginia. Much of the watershed is forested and includes portions of the Cherokee National Forest (Tennessee) and the Jefferson National Forest (Virginia). TVA operates South Holston Reservoir primarily for flood control and power production. The dam's single turbine is capable of producing a maximum of 38,500 kW and an average discharge of 2,400 cfs (68 m³/s). The tailwater extends ~13.7 miles from South Holston Dam to the headwaters of Boone Reservoir. It has an average width of 131 ft. and a surface area of about 217 acres at base flow (Bettoli et al. 1999).

Turbine discharges from South Holston Dam historically experienced a period of low dissolved oxygen (DO) during summer and fall (Scott et al. 1996). While this DO depression was not as severe as those in other TVA tailwaters, it was a concern for the trout fishery. To address this issue and a lack of minimum flow, TVA constructed an aerating labyrinth weir at SFHRM 48.5 (~1.25 miles below the dam) as part of its Reservoir Releases Improvement Program. The weir, completed in December 1991, maintains a minimum flow of 90 cfs (2.55 m³/s) in the tailwater and recovers approximately 40-50% of the oxygen deficit as water passes over it (Yeager et al. 1993). The turbines are typically pulsed twice daily to maintain the weir pool. Additionally, releases from South Holston Dam have been aerated via turbine venting since 1992 (Scott et al. 1996). The

weir and the turbine improvements combine to help maintain the target DO concentration of 6 ppm. Bettoli et al. (1999) found that DO levels downstream of the weir were suitable for good trout growth and survival and that water temperatures were usually below 68 °F (20 °C) and did not exceed 71.6 °F (22 °C).

Fingerling and adult rainbow and brook trout were first stocked in the South Holston Tailwater in 1952. Subsequently, the South Holston Tailwater has been managed as a put-and-take and put-and-grow trout fishery through annual stockings of both fingerling and adult (typically 9-12 inch) rainbow and brown trout. It continues to support one of the finest trout fisheries in Tennessee and the Southeast. It was estimated to have a total economic value of \$931,525 (Williams and Bettoli 2003).

Pfizer's (1954) study of east Tennessee tailwaters conducted in the early 1950's included the South Holston Tailwater, but TWRA made no subsequent surveys of the South Holston Tailwater until 1995, when two fish and benthic macroinvertebrate monitoring sites were established and sampled through 1998 (Bivens et al. 1996, 1997, 1998; Habera et al. 1999). These efforts provided information about the fish community and sport fishery in the South Holston Tailwater at a time when little other data existed. However, the small number of sample sites and potential for bias associated with stocking events rendered them inadequate for monitoring and managing this important fishery.

TVA also evaluated the sport fishery of the South Holston Tailwater at four stations in 1993 and 1994 as part of its biological and water quality assessment of tributary tailwaters (Scott et al. 1996). Electrofishing catch rates (all trout) in 1994 were 98 fish/h for trout ≥ 7 inches, 48 fish/h for trout ≥ 14 inches, and 17 fish/h for 16-22 inch trout (Scott et al. 1996) and were dominated by brown trout, as were TWRA's (except in 1998). TVA concluded that the water

quality and minimum flow improvements had much enhanced the tailwater's trout fishery (Scott et al. 1996). While TVA noted increases in the number of benthic macroinvertebrate taxa (including EPT taxa) and a decrease in the proportion of tolerant taxa following DO and minimum flow improvements in 1991 and 1992 (Scott et al. 1996), there was little change in corresponding tailwater benthic index scores ("fair" range for most samples; Scott et al. 1996).

Bettoli et al. (1999) conducted the first intensive study of the South Holston Tailwater trout fishery during 1997-1998. This work included an estimation of the composition and biomass of the overwintering trout population, a survey of trout spawning redds, assessments of survival and growth of stocked trout, and a creel survey. Biomass (about 80% brown trout) was estimated to be 207 lbs./acre (232 kg/ha) in May 1997, exceeding that for all other Tennessee tailwaters in the 1990s and rivaling that of other high-quality tailwater trout fisheries in the U.S. (Bettoli et al. 1999). Brown trout over 20 inches (508 mm) were relatively common throughout the tailwater and fish over 27 inches (686 mm) were present; however, few rainbow trout exceeding 18 inches (457 mm) and none over 20 inches were captured (Bettoli et al. 1999).

TVA collected gravid female brown trout throughout the South Holston Tailwater during its sport fish assessment sampling (1993-1994) and observed brown trout spawning below the labyrinth weir shortly after its installation (Scott et al. 1996). Bettoli et al. (1999) subsequently documented numerous trout redds during December 1997 and January 1998. A follow-up study (Banks and Bettoli 2000) during 1998-1999 and 1999-2000 identified trout spawning at seven distinct spawning sites throughout the tailwater. Spawning activity peaked in mid to late-December and was most intense in the vicinity of the island at River's Way (Banks and Bettoli 2000). Bettoli et al. (1999) noted successful recruitment of wild brown trout in May 1997, when wild age-1 brown trout represented 55% of all overwintering trout. Wild brown trout growth (0.43 inches/month) was similar to that for hatchery fish and growth rates of both rainbow and brown trout were comparable to those for populations in other tailwaters (Bettoli et al. 1999).

Establishment of a quality zone with special angling regulations was considered for the South Holston Tailwater during 1992-1993, but never officially proposed. Later, a quality trout management regulation based on a 16-22 inch PLR was proposed and established for the entire tailwater in 1999. Additionally, snagging for all species was banned in 1999 and two spawning refuges were (closed to fishing during November through January). These measures were taken to protect vulnerable large brown trout during the spawning season and to potentially improve recruitment. The spawning refuges and PLR became effective in November 1999 and March 2000, respectively. The first management plan for the South Holston Tailwater, covering 2004-2008, focused on improving the abundance of large trout and developing a wild brown trout fishery through these regulation changes (Habera et al. 2003).

IV. Current Status

Trout Abundance

TWRA began more intensive annual monitoring of the South Holston Tailwater trout fishery in 1999 using the 12 boat electrofishing stations (Figure 1) and protocol established by Bettoli et al. (1999). These monitoring stations are sampled during the day in early March at a flow of approximately 2,400 cfs and provide an assessment of the overwintering trout populations each year before stocking begins (Habera et al. 2008). Monitoring samples were not conducted in March 2008 because of the ongoing drought and TVA's need to maintain water levels in South Holston Reservoir.

The mean electrofishing catch rate for all trout ≥ 7 inches, the minimum size considered fully recruited to the sampling gear and technique, has steadily increased since 2001, exceeding 320 fish/h in 2007 (Figure 2). This is nearly five times the corresponding catch rate for 1997 obtained by Bettoli et al. (1999) and far exceeds that for any other Tennessee tailwater. The overall increase in the abundance of trout ≥ 7 inches was driven by growth of the brown trout population. The mean catch rate for brown trout ≥ 7 inches during 2004-2007 was 191 fish/h,

easily exceeding the previous management plan's objective of sustaining a brown trout abundance of at least 90 fish/h (≥ 7 inches) in the absence of stocking (Habera et al. 2003).

The catch rate for rainbow trout ≥ 7 inches has also increased since 2004, although much more modestly (46% during 2004-2007) than for brown trout (Figure 2). The mean catch rate for rainbow trout ≥ 7 inches during 2004-2007 was 65 fish/h, which achieved the previous management plan's objective of maintaining a rainbow trout abundance of at least 40 fish/h (≥ 7 inches) following a reduction of the fingerling stocking rate from ~100,000/year to 50,000/year (Habera et al. 2003).

Mean catch rates for larger trout also substantially increased during the previous management plan term (Figure 2). Electrofishing catch rates for all trout ≥ 14 inches and those within the 16-22 inch PLR averaged 22 fish/h and 12 fish/h, respectively, prior to establishment of the PLR. During 2004-2007, these catch rates averaged 52 fish/h and 25 fish/h, respectively. No other tailwater trout fishery in Tennessee consistently produces comparable catch rates for fish in these size groups. Brown trout have been largely responsible for these increases (as with trout ≥ 7 inches), but rainbow trout have shown positive responses as well (Figure 2). The previous management plan's objective, with respect to the PLR, was (ideally) for the mean catch rate for 16-22 inch fish to approach or exceed 20 fish/h by 2008 (Habera et al. 2003). This objective has been met since 2005 (Figure 2).

Stocking

Stocking rates for fingerling and adult rainbows and 6-8 inch brown trout were variable during 1990-1997, with an average of 71,000 stocked trout annually during this period (Figure 3). Stocking rates for adult rainbow trout and brown trout began to stabilize after 1997 at about 48,000 and 15,000 per year, respectively (Figure 3). Fingerling rainbow trout stocking rates

continued to fluctuate until 2004, when the rate was set at 50,000/year by the previous management plan (Habera et al. 2003). Brown trout stocking was discontinued in 2003 in conjunction with the effort to create a wild brown trout fishery. The wild brown trout produced in the South Holston Tailwater are genetically similar to the Plymouth Rock strain that was previously stocked (Habera et al. 2003). Since 2004, about 100,000 rainbow trout (50% fingerlings) have been stocked in the South Holston Tailwater each year (Figure 3).

Angler Use

Three creel / angler use surveys have been conducted on the South Holston Tailwater since 1997 (Table 1; Bettoli et al. 1999; Bettoli 2003; Bettoli 2007). The total estimated fishing pressure in 1997 (100,844 h; 29,028 trips) made it the most heavily fished tailwater trout fishery in Tennessee at the time. Angling pressure declined substantially by 2002 (52% for total hours; 39% for trips), then recovered somewhat by 2006 (Table 1). Catch rates over 0.7 fish/h are generally considered representative of good fishing (McMichael and Kaya 1991; Wiley et al. 1993) and catch rates for the South Holston Tailwater have routinely exceed 1.0 fish/h (Table 1). The 2002 and 2006 catch rates were statistically similar and significantly higher than the 1997 rate (Bettoli 2007). Harvest rates have remained relatively low (Table 1), with the 2006 rate (0.20 fish/h) being significantly below those observed in 1997 and 2002 (Bettoli 2007). This reflects the recent shift away harvest-oriented angling that has occurred in most Tennessee tailwaters (Bettoli 2007). Hutt and Bettoli (2003) characterized 23% of South Holston Tailwater anglers as non-consumptive specialists.

Table 1. Results of recent South Holston Tailwater creel surveys.

Year	Pressure (h)	Mean Trip length (h)	Trips	Catch rate (fish/h)	Harvest rate (fish/h)
1997	100,844	3.47	29,028	1.11	0.35
2002	48,190	2.71	17,782	1.71	0.32
2006	64,440	3.34	19,293	1.43	0.20

Anglers were more satisfied with fishing conditions at the South Holston Tailwater (score of 4.1 on a 5-point scale, with 5 indicating the highest level of satisfaction) than at other tailwater trout fisheries in Tennessee surveyed by Hutt and Bettoli (2003). This satisfaction continues, as 77% of the 279 anglers surveyed by Bettoli (2007) rated TWRA's management of the fishery as good or excellent (score of 4 or 5). Additionally, South Holston Tailwater anglers overwhelmingly support the special regulations in place there, with 82-88% in favor of the spawning refuges and 16-22 inch PLR permitting one fish over 22 inches to be harvested (Bettoli 2007).

V. Management Recommendations

The three primary objectives from the previous South Holston Tailwater management plan (Habera et al. 2003) – improvement of large trout abundance, creation of a wild brown trout fishery, and optimization of fingerling rainbow trout stocking rates – were achieved during that plan's term (2004-2008). Objectives for the current management plan (2009-2014) seek to maintain the quality of the trout fishery that has developed in this tailwater, and thereby fulfill the management goal.

Objective 1: Maintain the abundance of large trout in the fishery



The 16-22 inch PLR was established in 2000 to enhance the abundance of large trout in the fishery and, secondarily, to enhance natural reproduction and recruitment of wild trout to the fishery through protection of a large proportion of the spawning

population. This regulation, which permits one fish >22 inches to be harvested, has been quite successful and will continue during 2009-2014. Electrofishing catch rates for 16-22 inch fish increased from an average of 12 fish/h prior to establishment of the PLR (1997-2000) to ≥ 25

fish/h during 2005-2007. The objective during 2009-2014 will be to maintain a mean electrofishing catch rate for trout within the PLR (16-22 inches) of at least 25 fish/h. The relative rarity of 16-22 inch rainbow trout, both before and after establishment of the PLR, suggests that brown trout will continue to drive the abundance of larger fish.

Objective 2: Maintain the wild brown trout fishery

The South Holston Tailwater's brown trout fishery was already largely composed of wild fish at the inception of the previous management plan in 2003. Additionally, the PLR, spawning refuges (Figure 1), and a ban on all snagging were also in place at that time. All that remained for making the transition to a self-sustaining (wild) fishery – a relatively unique option for Tennessee tailwaters – was to eliminate brown trout stocking (which was done in 2003). Electrofishing catch rates for brown trout ≥ 7 inches averaged 79 fish/h during 1997-2003, and have steadily increased since then, reaching 254 fish/h in 2007 and averaging 191 fish/h during 2004-2007. Obviously, natural reproduction is quite capable of sustaining the South Holston Tailwater's brown trout fishery. Accordingly, no brown trout will be stocked during 2009-2014 and regulations directed at protecting and enhancing brown trout reproduction (spawning refuges and the snagging ban) will be maintained. The objective for 2009-2014 will be a mean electrofishing catch rate of at least 135 fish/h for brown trout ≥ 7 inches. This represents a 50% increase from the previous plan's objective of 90 fish/h, which was considered sufficient to sustain the fishery.

Objective 3: Maintain rainbow trout stocking rates

Despite a 50% reduction in the fingerling rainbow trout stocking rate during 2004-2007 (to 50,000 per year), the electrofishing catch rates for rainbow trout ≥ 7 inches increased 46% during the same interval (to Figure 2). This indicates that the rainbow trout fishery can be sustained at the lower fingerling stocking rate. Therefore, the current fingerling stocking rate of 50,000 per year will continue during 2009-2014, with the objective of maintaining a mean

electrofishing catch rate of at least 50 fish/h for rainbow trout ≥ 7 inches. This represents a 25% increase from the previous plan's objective of 40 fish/h, which was considered sufficient to sustain the fishery. The annual stocking rate for adult rainbow trout will remain consistent with rates used during the past 10 years (range, 39,000-53,000; mean, 47,000).

Evaluation

The 12 South Holston Tailwater monitoring stations will be sampled annually during 2009-2014. Following completion of the 2014 sampling efforts, an assessment of management objective accomplishments will be made and strategies will be adjusted, if necessary, to meet the South Holston Tailwater management goal.

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South Holston Tailwater

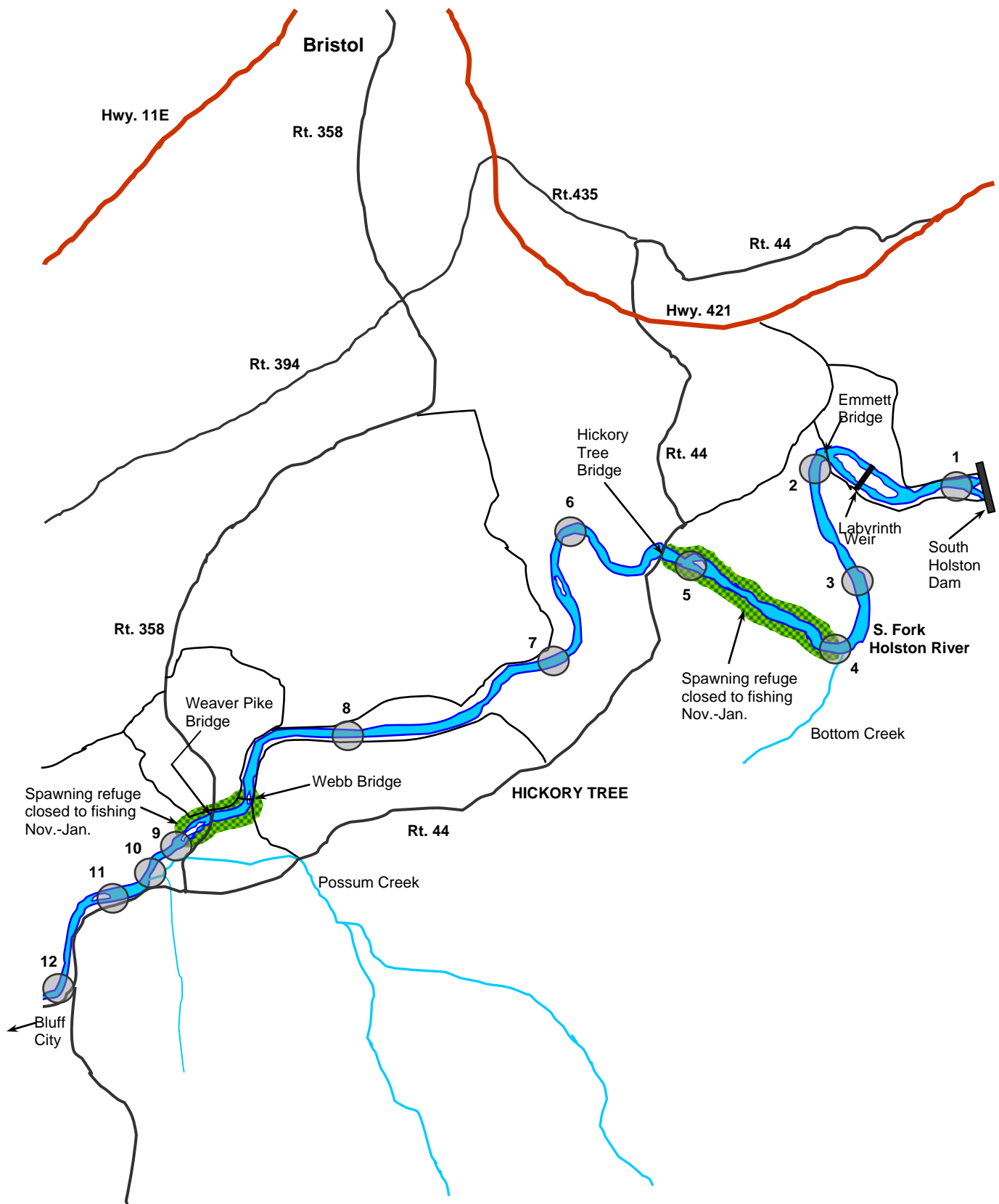


Figure 1. Locations of the South Holston Tailwater (South Fork Holston River) monitoring stations.

South Holston Tailwater Electrofishing Catch Rates

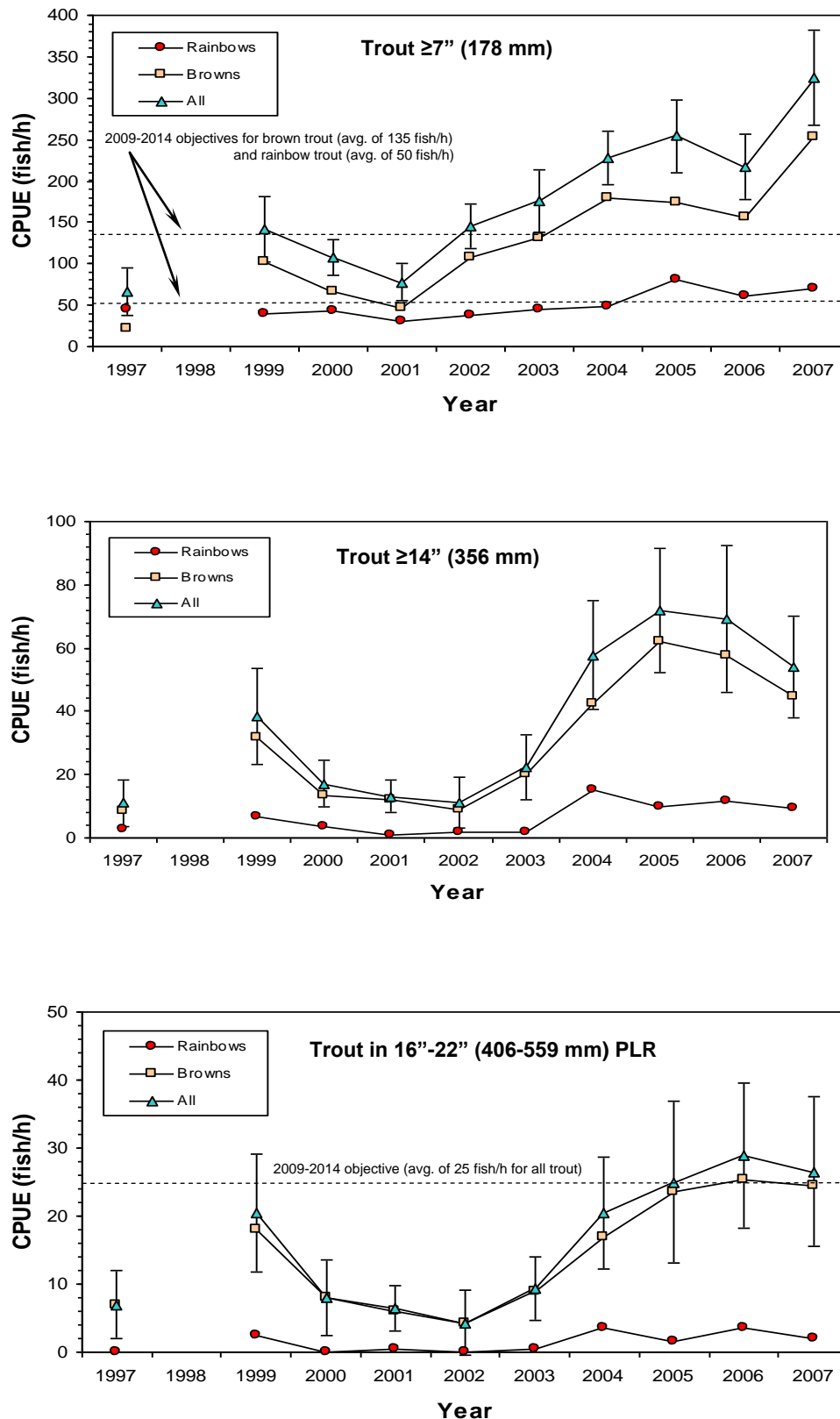


Figure 2. Mean electrofishing catch rates for the 12 South Holston Tailwater. Bars indicate 90% confidence intervals.

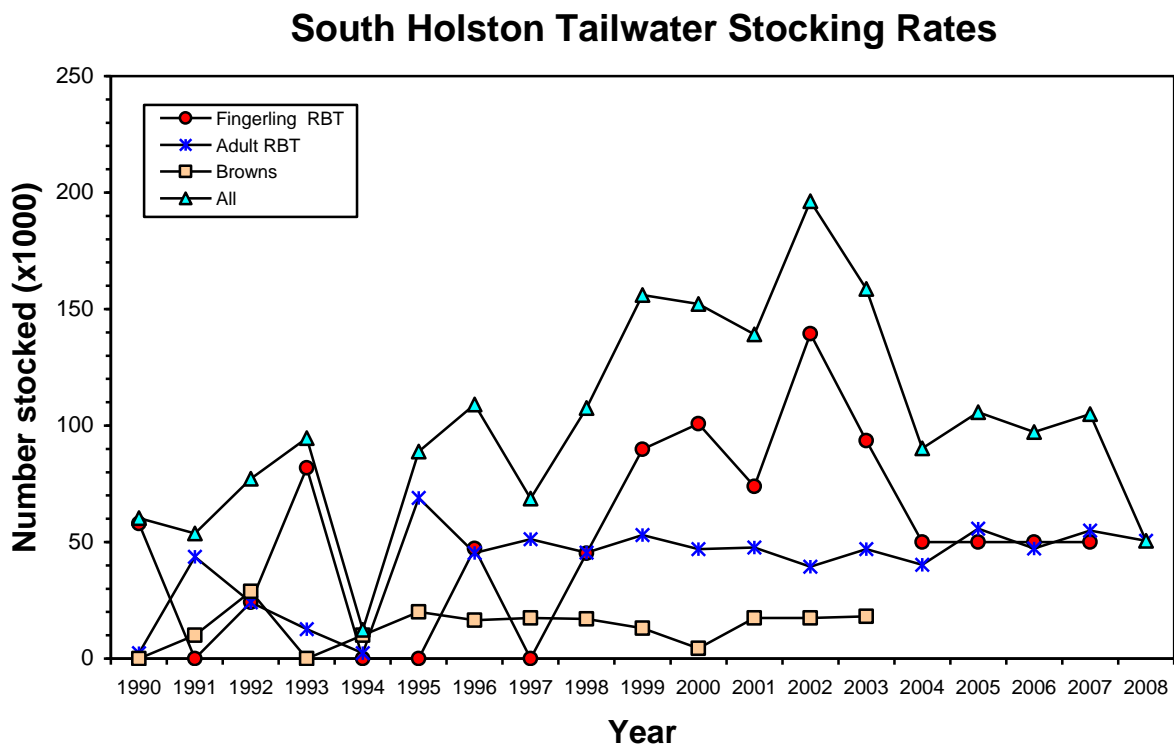


Figure 3. Trout stocking rates for the South Holston Tailwater (1990-2007). Currently, about 100,000 rainbow trout are stocked each year (50,000 fingerlings and ~50,000 adults). Fingerlings were not available from the Dale Hollow National Fish Hatchery in 2008 and were not stocked that year.